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NEW NYMPHS OF CANADIAN ODONATA

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During the summers of 1907, 1908 and 1912, the writer spent much of his time at the Great Lakes Biological Station, Go Home Bay (Georgian Bay), Ont., in collecting and rearing dragonflies (Odonata). A full account of this work will appear in the forthcoming report of the Marine Biological Stations of Canada; but, as this report will not be issued in the immediate future and is comparatively unknown to entomologists, it is thought best to publish in advance the descriptions of the new nymphs obtained.

Nymphs of certain species of *Aeshna*, which were reared for the first time at Go Home Bay, have already been described in the writer's memoir on this genus,* and are omitted from the present account. In addition to the species described from Go Home Bay, the nymph of *Somatoclora semicircularis* (Selys) from Vancouver Island is also included.

Nehalennia gracilis Morse

A few nymphs of this species were found in floating sphagnum bogs, some distance back from the open water. Several imagoes emerged in the laboratory during July.

I have compared these nymphs carefully with a few specimens of *N. irene* (Hagen) from Toronto, and the only differences I can find are the smaller size, less spinulose hind margin of the head and entire absence of spots on the gills. It is not improbable that none of these characters are constant, as I had but few specimens of either species for comparison.

In *N. gracilis* the convex posterior margin of the head has only 4-6 slender inconspicuous colourless spinules; in *N. irene* there are a dozen or more spinules, which are somewhat coarser and blackish at base (Figs. 2, 3); gills very slender, widest in the distal third, tapering somewhat more gradually than in *N. irene*, with no indication of spots (Fig. 1).

*The North American Dragonflies of the genus *Aeshna*. University of Toronto Studies, Biological Series, No. 11, 1912.

Length of body 8.25-9; gills 3-3.75 additional; hind wing-case 2.2-2.7; hind femur 2-2.33; width of head 2.33-2.4.

Enallagma cyathigerum calverti (Morse)

Full-grown nymphs were taken early in the season of 1912, several emerging in the laboratory on June 3 and 4. Mature adults were flying in numbers on June 1, and had about disappeared by the middle of the month. Nymphs were also reared at Lake Simcoe in 1909, adults emerging on June 4.

The nymph (Figs. 4, 5) is very similar in form to that of *E. hageni* (Walsh), but is considerably larger, with much darker gills. Eyes as in *hageni*, less prominent than in *E. signatum* and *E. pollutum* (Figs. 6, 7, 9), the curve of the posterior median excavation somewhat more flattened than that of the rather strongly convex margins on each side, the latter with a dozen or more spinules. Labium with 4 mental setæ and 6 (occasionally 5) lateral setæ; end-hook of lateral lobe preceded by 3 teeth of moderate size, which are preceded by 3 or 4 smaller, somewhat incurved denticles. Gills lanceolate, widest a little beyond the middle, ventral margin straight at base, dorsal margin convexly curved; apices bluntly pointed, with convexly curved margins or rounded. Across the middle of the gill is a distinct joint, proximad of which the margins are spinulose, the spinules of the ventral margin stronger than those of the dorsal; distad of the joint the margins are beset with a fringe of delicate hairs, much longer than those of *E. hageni*. Color dark brownish (probably olivaceous in life, each abdominal segment, except 10, with a dark lateral blotch, not seen in the exuviae; femora with a pale ring just before the apex, preceded by a dark ring. Gills dark greyish brown, deepening just beyond the median joint.

Length of body, 15.5(exuvia)-21.5; gills 6.5-8; hind wing 4.5-5; hind femur 4; width of head 3.5-3.7.

Enallagma pollutum (Hagen) Selys.

Among a number of Odonate nymphs, taken by Mr. R. P. Wodehouse at Waubashene and Fitzwilliam Island, Georgian Bay, in 1912, are numerous specimens of an undescribed form, which is so obviously nearly related to *E. signatum* that we have little hesitation in ascribing it to *E. pollutum*. This species is,

moreover, a common one here and is the only *Enallagma* of the region whose nymph has not been reared (except the rare *E. ebrium*).

Nymph (Figs. 9, 10), long and slender, eyes very prominent laterally, their postero-lateral margins forming with the sides of the head a marked excavation. Hind angles of head with numerous slender setæ, rounded, but very prominent and narrower than the median concavity. Labium with 3 mental setæ: lateral setæ 5; lateral lobes, before the end-hook, with three well-marked teeth, preceded by a feebly denticulate, almost truncate, margin. Abdominal segments 2-7, with prominent postero-lateral angles. Gills large, broad lanceolate, widest at the distal third, with a transverse median joint; basal half dark, except at the base; apical half whitish or grey, except a broad, dark anteapical band.

Colour brown (alcoholic, probably greenish in life), sides of head and thorax with a pale longitudinal band between two dark bands, the most ventral of which passes dorso-caudad to the bases of the front wing-cases. There are usually also a few dark spots on the head and thorax. Abdomen rather dark brown, almost uniform. Legs pale, femora with a very narrow, but usually well-defined, dark ring at the distal fourth.

Length of body 13 (contracted) to 18 (extended); gills 5-6.5; hind-wing 4.3-5; hind femur 3.5; width of head 3.25-3.4.

Boyeria grafiana Williamson.

The dark-coloured nymphs of this species are found rather commonly under stones, along more or less wave-beaten shores or wherever there is a perceptible current. Full-grown specimens were collected on and after June 4, 1912, the first adult emerging in the laboratory on July 14, followed by several others during the succeeding fortnight.

As the nymph of *Boyeria vinosa* was described before *B. grafiana* had been recognized as a distinct species, it is impossible to be certain whether the descriptions all refer to *B. vinosa* or not, but Needham's description* belongs, with scarcely a doubt, to that species.

We have reared a number of nymphs of *B. grafiana* and collected many exuviae as well as nymphs in several localities. We have also received a series of exuviae of a *Boyeria* from the Shawa-

*Bull. 47, N. Y. State Museum, p. 465, 1931.

naga River, collected by Mr. Paul Hahn, which differ very slightly from those of *B. grafiana*. The latter were also found on the same river. As *vinosa* and *grafiana* are the only North American species of *Boyeria*, and are both common in this region, there can be no doubt that the species not yet reared is *B. vinosa*.

The nymphs of these two forms may be separated as follows: Mentum of labium, 5.5 mm. long, its middle breadth scarcely less than half its length; fourth abdominal segment without lateral spines; lateral abdominal appendages of female one-fourth to one-third as long as the inferior appendages, and usually about as long as the dorsum of segment 10.....*B. vinosa*.
Mentum of labium 6.5-7 mm. long, its middle breadth distinctly less than half its length; fourth abdominal segment generally with distinct though very small lateral spines; lateral abdominal appendages of female, one-fifth to one-fourth as long as the inferior appendages, and one-half to three-fifths as long as the dorsum of segment 10.....*B. grafiana*.

B. grafiana also differs from *B. vinosa* in the slightly stouter inferior abdominal appendages, which are less incurved at the tips, and in the slightly larger size as shown by the following measurements:

B. vinosa.—Length of body 34-36.5; hind wing 6-7.5; hind femur 5-6; width of head 7.5-8.

B. grafiana.—Length of body 37-39; hind wing 7.5-8; hind femur 6-6.5; width of head 8-8.5.

In coloration the nymphs of these two species are quite similar, except that the pale, wavy, dorso-lateral streak on each side of the abdomen is usually quite distinct in *grafiana*, but more or less obscure in *vinosa*. In both species the depth of coloration varies considerably, usually being a rather dark brown. All the nymphs from the Go Home Bay district are very dark in colour, but the pale bands of the abdomen and legs are quite sharply defined. The most characteristic mark of *Boyeria* nymphs is a pale oval or diamond-shaped median blotch in the dorsum of segment 8.

Neurocordulia yamaskanensis (Prov.) Selys.

The nymphs of this interesting species are common at Go Home Bay and in the Muskoka Lakes district. They cling to the under sides of boulders, along the more exposed rocky shores or

near rapids. Exuviae are often found on precipitous rocks rising out of the water from a depth of 8 or 10 feet.

Nymph (figs. 15-17) short-legged and somewhat stouter than most Corduliine nymphs. Head broadly convex above and on the sides, eyes not very prominent, frontal ridge with a scurfy pubescence, the anterior margin convexly curved, hind angles of head prominent, distance between them a little greater than half the greatest width of the head; hind margin distinctly excavate.

Labium extending very slightly behind the bases of the front legs; mentum somewhat broader at the distal margin than long, the middle lobe somewhat abruptly deflexed, bluntly obtusangulate; mental setae 9-11, the innermost 3 or 4 much smaller than the others; lateral lobes triangular, their distal margins produced into seven semi-elliptical teeth; lateral setae 6; movable hook very slightly arcuate.

Marginal ridge of pronotum produced on each side behind the posterior angles of the head as a prominent process, which is somewhat smaller than the very prominent supra-coxal processes.

Legs short, the length of hind femora being slightly less than the width of the head.

Abdomen ovate, its greatest breadth at segs. 6 or 7, slightly greater than two-thirds of its length; curve of the lateral margins somewhat stronger in the distal than in the proximal half; lateral spines on 8 and 9, in each case about one-third to one-half as long as the corresponding segment, those on 8 strongly divergent, on 9 parallel and extending caudad scarcely or not at all beyond the tips of the appendages.

Dorsal surface rather strongly convex, dorsal hooks present on 1-9, those of the basal segments slender, nearly erect and slightly hooked, becoming gradually broader and lower caudad, and, on 7-9, reduced to scarcely more than a short ridge. Superior appendage triangular, equilateral, very slightly shorter than the somewhat divergent inferior appendages and somewhat longer than the lateral appendages.

Colour yellowish or orange-brown, variegated with dark-brown. Head dark brown above, generally somewhat paler in the centre and on the frontal ridge. Thorax and wing-cases variegated with pale and dark markings, femora and tibiae dark, with

two pale rings—a median and an anteapical. Abdomen yellowish brown, more or less distinctly blotched with dark brown, especially on the dorsal hooks, the lateral margins and spines and the dorso-lateral scars.

Measurements.—Length of body 22-24.5; mentum of labium 4; hind wing 6-7; hind femur 5.5-6; width of abdomen 9-10; width of head 6.5.

The nymph of this species shows the following differences from that of *N. obsoleta* (Figs. 18-19), two exuviae of which I have from Lake Hopatkong, Pa., received from Professor P. P. Calvert.

Somewhat larger, more elongate, and less depressed; eyes somewhat less prominent, mentum of labium a little longer and more narrowed at base; middle and hind legs somewhat less widely separated at their bases; abdomen narrower, the sides less strongly curved on the middle segments; lateral spines on seg. 9 much shorter than those of *obsoleta*, in which they are fully as long as the segment and extend far beyond the tips of the appendages; dorsal hooks also less developed than in *obsoleta*, in which they form quite-prominent tubercles on segs. 7-9.

Tetragoneuria spinigera Selys.

We have reared only two females of this species, these emerging on June 2, 1912, at a time when the period for transformation was about over. We also found a teneral male with its exuvia on June 1 and a large number of similar exuvia, which must belong to *T. spinigera* as *T. cynosura simulans*, the only other species resident in the Go Home Bay district, does not appear until a little later in the season.

A careful comparison was made between the exuviae of these two species, but no differences could be detected between them, except that in *spinigera* the lateral abdominal appendages average slightly longer than those of *cynosura*. This difference, however, does not appear to be constant. Prof. Needham, who referred certain nymphs to this species by supposition, employed as differential characters the length and amount of divergence of the lateral spines of segment 9. The two species discussed here are quite alike in respect to these features, which vary considerably among individuals of the same species.

Somatochlora semicircularis (Selys).

I have a teneral imago of this species with the exuvia, taken by Dr. A. G. Huntsman from a pond on Mt. Benson, near Nanaimo, B.C., on July 21, 1909. Dr. Huntsman states that both nymphs and imagoes were common here.

Nymphs (Figs. 26, 27): Eyes rather small, but fairly prominent; frontal ridge with numerous coarse hairs, its front margin gently convexly curved; antennæ with the basal segment slightly shorter and stouter than the second, the third slender and nearly as long as segs. 1 and 2, equal in length to 4.5 and to 6, 7 slightly shorter.

Head but little narrowed behind the eyes, the sides nearly straight and about one-third as long as the posterior margin, which is but little excavated; postero-lateral angles subrectangulate, rather prominent, with numerous hairs.

Labium extending back barely to the bases of the middle legs, apical width of mentum about equal to its length, sides slightly flaring distally; middle lobe moderately deflexed, obtusangulate, the margin minutely crenulate and spinulose; lateral lobes concave within, their inner margin with minute spinules of two or three sizes, distal margin with 9 or 10 well-marked, obliquely-cut, apically rounded teeth, each bearing a tuft of 3 or 4 spinules, of which the innermost is the largest. Mental setæ 10 or 11; lateral setæ 6; end-hook scarcely longer than the second antennal segment.

Lateral margin of pronotum and supracoxal process hairy, the former somewhat produced but rounded, the latter not very prominent.

Legs decidedly short, the hind femora being no longer than the hind wing-cases, rather stout and fringed with moderately long hairs.

Abdomen elongate-ovate, about as wide as the thorax, but little flattened, expanding but little from the broad base to seg. 5, narrowing very slightly on 6 and 7, more rapidly on 8 and 9; lateral margin fringed with hairs, which are long and dense, on 8 and 9; much shorter on the other segments. Lateral spines present only on seg. 9, somewhat less than one-third the length of the segment, slender, subparallel, their sharp tips slightly incurved. Dorsal

hooks wholly absent. Superior appendages triangular, slightly longer than its basal breadth, acuminate, apex slender-pointed; lateral appendages scarcely longer, flattened, their basal breadth nearly half that of the superior appendage, tapering to a point, outer margin gently curved; inferior appendage slender, slightly divergent, extending a little beyond the laterals.

No trace of a colour-pattern is visible in the exuvia.

Measurements.—Length of body .32; abdomen 13.5; hind wing-case 6.3; hind femur 6.3; width of head 6; width of abdomen 8.

The nymphs of this species differ from the other known nymphs of this genus in the absence of any trace of dorsal hooks. The head is much less narrowed behind the eyes, the postero-lateral angles more prominent and angulate and the legs decidedly shorter than in *S. williamsoni* Walk. and *S. metallica* Vand., the only other species of this genus whose nymphs I possess. It differs in the same characters from the nymph of *Cordulia shurtleffi*, to which it bears a considerable resemblance. There seem to be no very good generic characters for the separation of the nymphs of *Somatoclora*, *Cordulia* and *Dorocordulia*.

Leucorrhinia frigida Hagen.

This species is exceedingly abundant in all swamp waters in the Go Home Bay region, particularly in sphagnum-bogs. We have found the nymphs in large numbers and have reared many specimens.

Needham's description* of the nymph of this dragonfly belongs to another species (probably *L. proxima*). In a letter to the writer he stated that the species had not been reared, but that teneral of *L. frigida* had been found at the spot where the exuviae were gathered. The nymph of *frigida*, unlike Needham's species, possesses large dorsal hooks like the other species of *Leucorrhinia* that have been reared.

Nymph (Figs. 21-23) very similar to that of *L. intacta*, but somewhat smaller and the legs slightly slenderer. Head similar to that of *intacta*, except in the somewhat more prominent eyes; Labium of similar size and form, the lateral lobes somewhat more

*Bull. 24, New York State Museum, Ent. 23, p. 196, 1908.

deeply concave within, the teeth on the distal margin obsolescent. crenate, each with a single spinule; lateral setæ 9 or 10; mental setæ 10-13, the fourth or fifth from the outside longest, the inner four smaller than the others.

Abdomen broadest at seg. 6, scarcely narrowing on 7, slightly on 8, more abruptly on 9; lateral spines on 8 one-half to three-fifths as long as the segment, subparallel, those on 9 reaching about to the tips of the inferior appendages, their inner margins straight and parallel. Superior appendages somewhat less elongate than in *intacta*, acuminate, about twice as long as the lateral appendages. Dorsal hooks on segs. 3-8, larger on 3 and 4 than in *intacta*, less erect and more curved, very slender; those on 5-7 of about the same size as in *intacta* or somewhat larger and slightly more elevated, the curve of the upper margins much stronger proximally, the apices sharp and directed straight back, reaching about the middle of the following segment; on 8 similar to those of the preceding segments but less elevated, directed straight back.

The coloration when well marked is so exactly similar to that of *intacta* that it seems unnecessary to describe it. It is usually, however, rather obscure, though the legs are always distinctly banded.

Measurements. — Length of body 15-16; abdomen 9-10.6; hind wing 4.6-4.75; hind femur 4; width of abdomen 6-6.8; width of head 4.7-4.8.

EXPLANATION OF PLATES I. AND II.

- Fig. 1. *Nehalennia gracilis*.—Lateral gill.
- Fig. 2. *Nehalennia gracilis*.—Hind margin of head.
- Fig. 3. *Nehalennia irene*.—Hind margin of head.
- Fig. 4. *Enallagma calverti*.—Dorsal view of head.
- Fig. 5. *Enallagma calverti*.—Lateral gill.
- Fig. 6. *Enallagma hageni*.—Dorsal view of head.
- Fig. 7. *Enallagma signatum*.—Dorsal view of head.
- Fig. 8. *Enallagma signatum*.—Lateral gill.
- Fig. 9. *Enallagma pollutum*.—Dorsal view of head.
- Fig. 10. *Enallagma pollutum*.—Lateral gill.
- Fig. 11. *Boyeria grafiana*.—Labium.

Fig. 12. *Boyeria grafiana*.—Abdominal appendages of female nymph.

Fig. 13. *Boyeria vinosa*.—Labium.

Fig. 14. *Boyeria vinosa*.—Abdominal appendages of female nymph.

Fig. 15. *Neurocordulia yamaskanensis*.—Nymph.

Fig. 16. *Neurocordulia yamaskanensis*.—Terminal abdominal segments of female nymph.

Fig. 17. *Neurocordulia yamaskanensis*.—Lateral view of abdomen.

Fig. 18. *Neurocordulia obsoleta*.—Terminal abdominal segments of female nymph.

Fig. 19. *Neurocordulia obsoleta*.—Lateral view of abdomen.

Fig. 20. *Leucorrhinia intacta*.—Dorsal view of head.

Fig. 21. *Leucorrhinia intacta*.—Terminal abdominal segments of female nymph.

Fig. 22. *Leucorrhinia intacta*.—Lateral view of abdomen.

Fig. 23. *Leucorrhinia frigida*.—Dorsal view of head.

Fig. 24. *Leucorrhinia frigida*.—Terminal abdominal segments of female nymph.

Fig. 25. *Leucorrhinia frigida*.—Lateral view of abdomen.

Fig. 26. *Somatochlora semicircularis*.—Dorsal view of head.

Fig. 27. *Somatochlora semicircularis*.—Terminal abdominal segments of male nymph.

OBITUARY.

MR. FRANKLIN A. MERRICK died December 16th, 1912, at New Brighton, Pa., at the age of 68 years. He was well known as a diligent and successful collector of Lepidoptera, of which he accumulated a large number of species. Though engaged in business pursuits for a great many years, he found time to devote himself to this Department of Entomology, and maintained a correspondence with others of similar tastes in many parts of the continent. His collection, which was large and valuable, is now in the possession of Dr. Barnes, of Decatur, Ill.

THE IMPERIAL BUREAU OF ENTOMOLOGY

BY C. GORDON HEWITT, D.SC., DOMINION ENTOMOLOGIST, OTTAWA.

As the question of international effort and co-operation in the matter of controlling and preventing the spread of insects, which in various ways affect human activity, is occupying the attention not only of entomologists, sanitarians and workers directly occupied in studying these many-sided problems, but also of statesmen and administrators, the formation in connection with the British Imperial Service of an Imperial Bureau of Entomology at the beginning of the present year will undoubtedly interest all concerned in these problems by whom the progress and work will be watched.

This organization is not a sudden development, but a gradual outgrowth of efforts along similar lines which began in the spring of 1909. In March of that year a meeting was called by the Secretary of State for the Colonies at the Colonial Office in London, in which the present writer had the honour to take part, to discuss the formation of an Entomological Research Committee for the purpose of furthering entomological research in the British possessions in tropical and sub-tropical Africa. The chief insects which it was considered desirable to study were those associated with the transmission of disease. In 1909 an Entomological Research Committee of the Colonial Office was appointed by Lord Crewe, then Secretary of State for the Colonies, and it consisted of the chief experts in entomology and tropical medicine in Great Britain and Ireland, with Lord Cromer as Chairman. Its work fell under three divisions—namely, the carrying on of investigations and entomological surveys in tropical Africa, for the purpose of which two travelling entomologists were employed; the determination of entomological material and the publication of the work so accomplished, for which purpose the "*Bulletin of Entomological Research*," a quarterly journal, was started. Through the generosity of Mr. Andrew Carnegie, the Committee was able also to undertake the training of Entomologists for service in the Dominions and Colonies.

On account of the valuable service which was being rendered by the Committee to the African Crown-Colonies and Protectorates, suggestions were made for the enlargement of the scope of the work of the Committee. Accordingly, in June 1911, advantage was taken of the presence in England of the Prime Ministers of the

June, 1913

self-governing Dominions, and a Conference was called by the Secretary of State for the Colonies to consider the desirability of further extending the work already begun by securing the co-operation and financial support of the self-governing Dominions and Colonies. By this means mutual assistance could be rendered by the various countries within the British Empire through the medium of a central bureau which would be engaged in the collection and interchange of information in regard to noxious insects. It was unanimously agreed that the establishment of such a central bureau was desirable, as it was realized what valuable assistance it could render in the way of disseminating information and rendering assistance in other ways. Accordingly, a tentative scheme was submitted to the governments of the various self-governing Dominions and Colonies for their consideration.

After due consideration, a further Conference was held at the Colonial Office in August, 1912, to which the government entomologists of the self-governing Dominions and Colonies, and others similarly interested, were invited to discuss and work out a scheme for Imperial co-operation in preventing the spread and furthering the investigation of noxious insects. At this Conference the whole subject was thoroughly discussed, and a proposal was evolved for the establishment of an Imperial Bureau of Entomology to be financially supported by the various Dominions and Colonies and the British Government.

It was proposed that the functions of the Imperial Bureau of Entomology be as follows:

1. A general survey of the noxious insects of the world and the collection and co-ordination of information relating thereto, so that any British country may learn by inquiry what insect pests it is likely to import from other countries and the best methods of preventing their introduction and spread.
2. The authoritative identification of insects of economic importance submitted by the officials of the Departments of Agriculture and Public Health throughout the Empire.
3. The publication of a monthly journal giving concise and useful summaries of all the current literature which has a practical bearing on the investigation and control of noxious insects.

The scheme was accepted by the various self-governing Dominions and Colonies which were invited to co-operate, and the Crown-Colonies and British Protectorates will also participate in the advantages of the Imperial Bureau of Entomology which has now been established. The former Entomological Research Committee has become the Honorary Committee of Management, with the eminent administrator, the Earl of Cromer, as President, and the Scientific Secretary of the Committee, Mr. Guy A. K. Marshall, has been made Director of the Bureau and Editor of the Journal. The Government Entomologists of the Dominions are *ex-officio* members of the Committee of Management.

The publication of the Bureau's journal, which is entitled "*The Review of Applied Entomology*," was commenced in January. It is being published in two parts: Series A, Agricultural; and Series B, Medical and Veterinary. As the organization and library of the Bureau becomes perfected, the value of this journal to entomological workers cannot be overestimated, when it is remembered that there are no less than 1700 periodicals—scientific, agricultural and medical—which may contain articles dealing with entomology, but a small proportion of which widely scattered entomologists have the opportunity of seeing or the time to consult.

An idea of one aspect of the three years' work of the original Entomological Research Committee will be gathered from the fact that the collections received from collectors in tropical Africa and other parts of the world during that time amounted to about 190,000 insects, of which no less than 56,000 were actual or potential disease carriers. The value of this function of the Bureau to entomologists situated in portions of the Empire where there are no collections and little literature to aid them in identification will be realized by their more fortunate fellow-workers.

It has been stated that the Imperial Bureau of Entomology will serve the needs of the British Empire in a manner similar to that in which the United States Bureau of Entomology serves those of the United States. This statement, however, is not correct. Its primary function will be that of an intelligence Bureau, collecting information for the use of British countries supporting it and assisting entomologists and other officials in those countries in the identification of their material. By these methods which have

been mentioned and by the publication of "*The Review of Applied Entomology*," it will furnish a means of assistance and of co-ordination of effort in the war against noxious insects, which will undoubtedly soon make its services invaluable in the further development of the countries, and especially the tropical and sub-tropical countries, of the British Empire. International, as the scope of its inquiries are, the work of the Bureau cannot but prove to be one of the most potent factors in enabling us to develop the agricultural and other resources of the Empire, and our fellow-workers in non-British countries can avail themselves, through this journal, of some of the fruits of the Bureau's work.

GEOMETRID NOTES.—A NEW VARIETY.

BY L. W. SWETT, BOSTON, MASS.

Therina fiscellaria Gn., var. *Johnsoni*, Nov.—Expands 30 m.m. Fore wings smoky ochreous instead of being yellow as in the normal form. The fore wings are smoky to the basal band, which shows as a bright ochreous line, crossing from costa to inner margin in a regular curve. The mesial space is smoky, with black discal dot showing faintly through. Extra-discal line bright ochreous, curved from costa to median vein, then back sharply in a deep curve to inner margin, as in normal *fiscellaria*. Beyond the wing is smoky black to outer margin. Fringe short and smoky ochreous. Antennæ and head ochreous; body of the same colour. Hind wings smoky ochreous to extra-discal line, which rounds out to a point opposite the black discal spot, the line being ochreous as on the fore wing. Beyond the extra-discal line the wing is smoky to outer margin. The insect, on the whole, seems rather semi-hyaline in appearance, and is no doubt a melanic form. Beneath the fore wings are much lighter than above, with the markings showing through. Hind wings lighter than above, almost a dark fawn colour, with lines showing through from above.

This seems to be a rare form and quite distinct from any described variety. I take pleasure in naming this variety after my kind friend, Mr. C. W. Johnson, who has rendered me valuable help and suggestions.

Type.—1 ♂ from Dr. C. S. Minot, North East Harbor, Me., Sept. 24, 1909, in the collection of the Boston Society of Natural History.

June, 1913

NOTES ON THE SYNONYMY OF SOME GENERA AND SPECIES IN THE CHLOROPIDÆ (DIPTERA).*

BY J. R. MALLOCH, BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

Williston, in his "Manual of North American Diptera," 1908, gives to this family the name Oscinidæ. Unfortunately, the generic name *Oscinis* is a synonym of the earlier name *Chlorops*, as indicated in the following synonymy, so that, even had the name of the family not previously been Chloropidæ, the name Oscinidæ could not be retained. Coquillett, in his paper on "The Type-Species of the North American Genera of Diptera," 1910, made some alterations in the status of certain genera in the family, but some of his conclusions are incorrect. Most European authors refuse to accept Lioy's genera, and of those who have dealt with this family in recent years only Enderlein has recognized any of Lioy's genera as valid. While many of Lioy's genera are synonyms of older genera, and his identifications often obviously wrong, it must be apparent to an unbiased person that wherever it is possible to decide definitely what his genera are, and in all cases he cites species, they must be accepted, provided they are in other respects valid. It seems to me that the acceptance of Meigen's genera included in the 1800 paper, and those of his 1803 paper which had no species included in them, by European writers and their wholesale disregard of Lioy's genera savors slightly of inconsistency. Enderlein, in a paper on the subfamily Oscinosominiæ (Sitz. d. Ges. Naturf. Freu, 1911), evidently was unaware of the fact that Coquillett had made use of Lioy's genera in 1910 and retained the generic name *Oscinosoma*, which Coquillett sunk as a synonym of *Botanobia*, and reversed the order as given by that writer. Possibly his reason for using the generic name *Oscinosoma* was to retain as the name of the subfamily one which had as near an approach to the old one (*Oscinis*) as possible. This position might be tenable, even though *Botanobia* has line priority, but for the fact that Coquillett had previously indicated *Botanobia* as the generic name to replace *Oscinis* and gave *Oscinosoma* as a synonym. It is regrettable that these questions of nomenclature occur so often, and that they cause such confusion; but, when they do crop up, it is advisable that they should be settled, and when one under-

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takes to decide a matter of this kind, it is always best to give the reasons why such decisions are arrived at. Having been engaged upon some work on the American species in this family, I find that it is necessary for me first of all to decide upon the correct nomenclature, both of genera and species, before I can publish any descriptive matter or give identifications of species to be used in the publications of the Bureau of Entomology. Thus, I have undertaken the rather unwelcome task of revising the nomenclature of the group, in so far as the American genera are concerned, in the hope that such revision may be of use to other students of the family.

Family Chloropidae

Subfamily Chloropinae.

ELLIPONEURA Loew, Berl. Ent. Zeitschr., Vol. 13, 1869, p. 44.

Type: *Elliponeura debilis* Loew.

MEROMYZA Meigen, Syst. Besch. Zweifl. Ins., Vol. 6, 1830, p. 163.

Type: *Musca sallatrix* Linné.

CETEMA Hendel, Wien. Ent. Zeit., Vol. 26, 1907, p. 98.

Centor Loew, Zeit. Ent. Breslau, Vol. 15, 1866, p. 7 (pre-occ.)

Type: *Oscinis cerceris* Fallen.

ANTHRACOPHAGA Loew, Zeit. Ent. Breslau, Vol. 15, 1866, p. 15.

Type: *Musca strigula* Fabricius.

HAPLEGIS Loew, Zeitschr. Ent. Breslau, Vol. 15, 1866, p. 22.

Type: *Chlorops diadema* Meigen.

DIPLOTOXA Loew, Zeitschr. Ent. Breslau, Vol. 15, 1866, p. 31.

Type: *Chlorops versicolor* Loew.

CHLOROPS Meigen, Illig. Mag., Vol. 2, 1803, p. 278.

Type: *Chlorops laeta* Meigen.

Coquillett gives this genus as synonym of *Titania* Meigen, 1800, presumably on the strength of Hendel's representations in his paper dealing with Meigen's genera (Verh. Zool. bot. Ges. Wien., Vol. 58, 1908, p. 43), but, as Hendel afterwards points out (Wien. Ent. Zeit., Vol. 29, 1910, p. 312), *Titania* is more probably synonymous with *Gaurax* Loew.

CHLOROPISCA Loew, Zeitschr. Entom. Breslau, Vol. 15, 1866, p. 79.

Type: *Chlorops glabra* Meigen.

EURINA Meigen, Syst. Besch. Zweifl. Ins., Vol. 6, 1830, p. 3.

This genus has been recorded as occurring in America, but the species included in it from this country is not congeneric with the

type, *Eurina lurida* Meigen. In the National Museum collection the series of *exilis* Coquillett stands among the members of the genus *Chlorops*, having been removed to that genus by Coquillett. ECTECEPHALA Macquart, Dipt. Exot. Supp. 4, pt. 2, 1851, p. 280.

Type: *Ectecephala albistylum* Macquart.

Subfamily BOTANOBINÆ.

CERATOBARYS Coquillett, Jour. N. Y. Ent. Soc., Vol. 6, 1898, p. 45.

Type: *Hippelates eulophus* Loew.

HIPPELATES Loew, Berl. Ent. Zeitschr., Vol. 7, 1863, p. 36.

Type: *Hippelates plebejus* Loew.

Opetiphora Loew, Dipt. Amer. Sept. Indig. Cent. 10, 1872.

Siphomyia Williston, Trans. Ent. Soc. Lond., 1896, p. 418.

CRASSISETA von Roser, Corres. Landw. Ver. Wurtemb., 1840, p. 63.

Type: *Oscinis cornula* Fallen.

The genus *Elachiptera*, which has as its type *brevipennis* Meigen, does not occur in America, so far as our present information goes.

GAURAX Loew, Dipt. Amer. Sept. Indig. Cent. 3, 1863, p. 35.

Type: *Gaurax festivus* Loew.

Titania Meigen, Nouv. Class. Mouch., 1800, p. 35 (Nom. Nud.)

Macrostyla Lioy, Atti Istit. Veneto, ser. 3, Vol 9, 1864, p. 1126.

Titania has never had any species placed in it and must be considered as "nomen nudum," though there is a possibility that it may have been a species of *Gaurax* Meigen had before him when he wrote the description in his 1800 paper.

MADIZA Fallen, Dipt. Suec, Oscinid., 1820, 8.

Type: *Oscinis oscinina* Fallen.

Siphonella Macquart, Hist. Nat., Dipt., Vol. 2, 1835, p. 584.

Eurinella Meunier, Bull. Soc. Ent. France, 1893, p. 193.

Coquillett gives *Siphunculina* Rondani, as a synonym also, but this is really the genus afterwards described as *Microneurum* by Becker, which does not at present find a place in the American list.

BOTANOBI Lioy, Atti Istit. Veneto, ser. 3, Vol. 9, 1864, p. 1125.

Type: *Oscinis dubia* Macquart.

Oscinis authors, not Latreille.

Oscinosoma Lioy, Atti Instit. Veneto, ser. 3, Vol. 9, 1864, p. 1125.

? *Strobliola* Czerny, Verh. Zool. Bot. Ges. Wien., Vol. 59, 1909, p. 289.

Oscinella Becker (Bull. Mus d' Hist. Nat. Paris, 1909, p. 119), Arch. Zool. Budapest, I, 1910, p. 150.

Coquillett accepted *Botanobia* as the name to substitute *Oscinis* Latreille, which had been erroneously used by authors as the generic name for that group, the type of which he indicates as given above. Presumably, he did so because the name appears first in Lioy's paper, though it has only line priority over the one adopted in 1911 by Enderlein, as indicated at the beginning of these notes.

Botanobia frit, Linné, Fauna Suec., 1761, p. 1851 (*Musca*).

Musca hordei, Bjerk., Vetensk. Akad. Handl. 34, 1777 (*Musca*).

Carbonaria Loew, Dipt. Amer. Sept. Indig. Cent., 7, 1866 (*Oscinis*).

The above synonymy is in accordance with facts ascertained from a comparison of American and European material.

TRICIMBA Lioy, Atti Istit. Veneto, ser. 3, vol. 9, 1864, p. 1125.

Type: *Tricimba linella* Fallen.

Notonaulax Becker, Mitth. Zool. Mus. Berlin, 1903, p. 153.

Through Becker disregarding Lioy's work, he did not recognize the fact that that author had clearly defined this genus, and cited as the type of his genus *Notonaulax* one of the two species Lioy included in *Tricimba*.

This genus occurs in America. The species described as *trisulcata* by Adams (Ent. News, Vol. 16, 1905, p. 111) belongs here.

A NEW GENUS AND ONE NEW SPECIES OF CHALCIDOIDEA.

BY A. B. GAHAN, MARYLAND EXPERIMENTAL STATION, COLLEGE
PARK, MD.

During the summer of 1912 a series of specimens of a Pteromalid were reared by the writer from cocoons of *Cladius pectinicornis* Fourcr. They were found to run readily to the genus *Celopisthia* Foerst. in Dr. Ashmead's "Classification of the Chalcid

June, 1913

Flies." Upon comparison with a specimen in the United States National Museum, of *Cælopisthia vitripennis* Thoms., one of the two European species of the genus (not the genotype species), they were found to differ materially. Unfortunately, specimens of the genotype species, *C. cephalotes* Thoms., are not available for comparison, but there seems no reason to doubt that this species and *C. vitripennis* are congeneric. A new genus is therefore erected for the reception of the parasite of *Cladius pectinicornis*, which appears to be undescribed.

Cælopisthia nematocida (Pack) Hewitt and *C. diacrisia* Crawford, being congeneric with the new species, are also included. *C. fumosipennis* Gahan is a true *Cælopisthia* and the only described North American representative of that genus. *C. smithii* Ashm. (manuscript name in Smith's Insects of New Jersey, 1900, p. 559) does not belong in the tribe Pteromalini since one mandible is 3-toothed and the other 4-toothed. It therefore falls in the tribe Eutilini and does not appear to fit any genus in that tribe.

The new genus is distinguished from all except *Cælopisthia* in the tribe Pteromalini by the immargined occiput, non-produced propodeum, subequal stigmal and postmarginal veins, and the long antennal pedicel. From *Cælopisthia* it may be distinguished as follows:

Both antennal ring-joints elongate, as long or longer than broad; discal cilia of the anterior wings reduced to mere dots or punctures, the hairs obsolete; marginal vein nearly three times as long as the stigmal; abdomen short, rotund. *Cælopisthia* Færster. First ring-joint strongly transverse, the second as long or nearly as long as broad; discal cilia developed on the apical two-thirds of the wing at least; marginal vein scarcely twice the length of the stigmal; abdomen ovate or conic ovate. . . . *Cælopisthoidea*. n. g.

CÆLOPISTHOIDEA, new genus.

Head large, much wider than thorax, broad antero-posteriorly, occiput concave, the occipital forminal depression angularly defined but immargined. Antennæ 13-jointed, inserted on a line with the lower extremities of eyes; scape slender; pedicel longer than the first joint of funicle; two ring-joints, the first transverse, the second elongate, much longer than the first; funicle 6-jointed cylindrical; club 3-jointed, acuminate. Face below the antennæ receding;

mandibles both four-toothed. Parapsidal furrows subobsolete on the posterior half of the mesonotum, impressed anteriorly; scutellum large, moderately convex; propodeum not prolonged into a neck, the median longitudinal carina and lateral folds present, spiracles prominent long-ovate. Wings hyaline, the marginal vein about twice as long as the stigmal, the postmarginal and stigmal subequal, marginal cilia present but short. Posterior tibiae with one spur. Abdomen sessile, ovate or conic ovate.

Type of genus—*Cælopisthoidea cladiæ*, n. sp.

KEY TO THE SPECIES OF CÆLOPISTHOIDEA.

1. Postmarginal vein slightly shorter than the stigmal vein.
Anterior wings slightly dusky.....*diacrisiæ* Crawl.
Postmarginal vein not shorter than the stigmal; anterior wings hyaline.
2. Propodeum with a deep circular fovea on either side of the short apical neck; lateral ocelli as far from the eye margin as from each other; anterior wing apparently without marginal cilia.....*nematicida* Pack.
Propodeum without deep fovea either side of the apex; lateral ocelli as close to the eye margin as to the anterior ocellus, much closer to the eye than to each other; anterior wings with weak marginal cilia on the posterior margin toward the apex.....*cladiæ*, n. sp.

Cælopisthoidea cladiæ, n. sp.

Female.—Length about 2.5 mm. Head and thorax æneous, closely reticulate-punctate; scape reddish testaceous, the pedicel and flagellum dark brown, pedicel longer than the two ring-joints and first joint of funicle combined, first ring-joint transverse, second as long as broad; funicle joints not longer than broad, the apical ones not as long as broad; club acuminate, three-jointed, the joints about as long as the funicle joints. Ocelli in an obtuse angled triangle, the lateral ocelli nearer the eye margin than to the anterior ocellus.

Punctures of the mesoscutum somewhat smaller and deeper than those of the head, apical portion of the scutellum differently sculptured from the anterior portion, giving the appearance of a transverse line before the apex; true metanotum punctate; propodeum punctate, the lateral folds distinct and complete, median

carina also well defined, spiracles long-ovate and prominent; neck of the propodeum short, smooth and shining and without a distinct circular depression either side. Wings hyaline, the postmarginal as long as the marginal, marginal cilia of the anterior wings absent, except for a very few weak cilia on the posterior margin toward the apex; basal portion of the anterior wing to the apex of the costal cell hairless, except for a single row of hairs in the costal cell, remainder of the wing ciliate but with the hairs very short. Anterior and posterior coxæ more or less metallic on the outer side; median pair brownish; all trochanters, femora, tibiæ, and tarsi pale testaceous, the femora and tibiæ tinged with brownish. Abdomen ovate, pointed at the apex, smooth and shining, dark brown, with the basal segment metallic.

Male.—Coloured like the female, but a brighter green, with stronger reflections; antennæ shorter than in the female, the joints of the funicle not as long as broad, the club short and compact.

Type locality.—Upper Marlboro, Prince George County, Md.

Host.—*Cladius pectinicornis*.

Type.—Cat. No. 15,506, United States National Museum.

Thirty females and three males in the type series. The type and several paratypes deposited in the United States National Museum. Remaining paratypes in the collection of the Maryland Experiment Station, College Park, Md.

Mr. E. N. Cory, of this Department, brought me several pupæ of the sawfly which he had secured on rose bushes at the farm of Mr. R. S. Hill, Upper Marlboro, Md., August 6, 1912. At the same time he turned over to me a single live female of the parasite which he had taken crawling over the sawfly cocoons. This parasite and the sawfly cocoons were placed together in a vial on my desk. The parasite died and was pinned August 12, without having been observed to oviposit. August 19 there emerged in the vial thirteen specimens of the parasite. Examination of the cocoons on this date showed that all these parasites had come from a single sawfly pupa. One of the remaining cocoons was found to be packed full of the naked pupæ of the parasite, which at this time were pale-yellowish, with the eyes dark-red, and measured a little over 2 mm. in length. August 27th, adults to the number of 20 emerged from this lot of pupæ. While proof is lacking, it seems

probable that this last lot of parasites were from eggs deposited by the captured female, either just before or shortly after her capture. *C. nematocida* is said by Hewitt* to be able to develop from egg to adult within a period of twenty-three days.

SPECIES OF LEPIDOPTERA NEW TO OUR FAUNA. WITH SYNONYMICAL NOTES

BY WM. BARNES AND J. MCDUNNOUGH, PH.D., DECATUR, ILL.

In working over some material in the Barnes Collection we have come across several species unrecorded from the United States. As the localities are authentic, we think it wise to note their occurrence. We are indebted to Dr. Skinner for several of the determinations.

Diurnals.

Synchlœ endeis G. & S.

Synchlœ endeis Godman & Salvin, Ann. Mag. Nat. Hist., (6) XIV., p. 97; id., Biol. Cent. Am. Rhop., II., 673, Pl. 108, figs. 5 and 6 (1901).

We have before us 1 ♂ labelled "Texas" and 1 ♀ much worn from Edwards Co., Texas, May 1902, received from Mr. H. Lacey, of Kerrville.

Myscelia ethusa Bdv.

Cybdelis ethusa Boisduval in Cuv. Rig. An. Ins. Atl. II., t. 138, fig. 3.

Myscelia cyanecula Felder, Reise Nov. Lep. 408, t. 53, f. 5.

Myscelia ethusa Godman & Salvin, Biol. Cent. Am. Rhop. I., p. 232 (1883).

One very perfect ♂ specimen from Brownsville, Texas, captured Oct. 15th.

Lasaia agesilas narses Staud.

Lasaia narses Staudinger, Exot. Schmett. I., p. 257 (1888); Stichel, Berl. Ent. Zeitsch. 55, p. 48 (1910); id. Gen. Insect. Riod., p. 187 (1911).

Two specimens from Brownsville, Texas, April 11th and June 11th (G. Dorner). We have not seen the original description of this species; but, according to Stichel's short diagnosis, they would seem to be best placed under this name. They certainly do not

*CANAD. ENT., XLIII., 1911, p. 302.

June, 1913

agree very well with the figure in the Genera Insectorum of *sula* Stdr. which Stichel records from Texas.

Thecla pastor Butl. & Dru.

Strymon pastor Butler & Druce, Cist. Ent. I., p. 105.

Thecla pastor Godman & Salvin, Biol. Cent. Am. Rhop. II., 34, Pl. 52, figs. 8-10.

Five ♂s and one ♀ from Brownsville, Texas, (May-June). The brown marginal lunules of secondaries on under side point to this species, but the subterminal white broken line is stronger in our specimens than in the figure in the Biologia.

Thecla azia Hew.

Thecla azia Hewitson, Ill. Diur. Lep. 144, Pl. 57, figs 357-8; Godman & Salvin, Biol. Cent. Am., Rhop. II., 91.

One ♀ from Paint Creek, Edwards Co., Texas, received through Mr. H. Lacey. The red marginal line of under side of both wings is characteristic; the species is related to *clytie* Edw., but is without doubt distinct.

Thecla cestri Reak.

Thecla cestri Reakirt, Proc. Acad. Phil. 1866, p. 338. Godman & Salvin, Biol. Cent. Am. Rhop., p. 96, Pl. 58, figs. 12-13.

One ♀ from Brownsville, Texas, Oct. 15th (G. Dorner). The maculation of the underside of secondaries is brown, rather than black, as given by Godman & Salvin; but more material is needed before deciding whether the Texan form represents a geographical race or good species.

Cogia calchas H. S.

Eudamus calchas Herrich Schaeffer, Prodr. III., p. 68 (1868).

Cogia calchas Godman & Salvin, Biol. Cent. Am. Rhop. II., p. 340.

A series of both sexes from Brownsville, Texas, and San Benito, Texas, taken in July and October, is before us.

Xenophanes tryxus Cram.

Papilio tryxus Cramer, Pap. Exot. Pl. 334, figs. G. H.

Xenophanes tryxus Godman & Salvin, Biol. Cent. Am. Rhop. II., p. 387.

Two ♂s and two ♀s are before us, collected at Brownsville, Texas, in May and July.

*Noctuidæ.**Oxycnemis dunbari* Harv.

Hadena dunbari, Harvey, Can. Ent. VIII., 52 (1876).

Litholomia dunbari, Smith, Bull. 44, U.S.N.M., 226 (1893).

Oxycnemis definita Barnes and McDunnough, Cont. Nat. Hist. N. Am. Lep., I, (5) 17, Pl. II., fig. 3 (1912).

Mr. Wolley-Dod recently called our attention to the fact that our *definita* was probably synonymous with *dunbari* Harv. An examination of Harvey's type in the Edward's Coll. by Dr. Barnes showed a strong claw on fore tibia, which had evidently been overlooked by Smith, and confirmed Dod's suspicions. The species certainly is no *Litholomia*; we place it doubtfully in *Oxycnemis* for the present. Hampson's figure, which misled us, (Cat. Lep. Phal., pl. 100, fig. 31) does not represent this species at all, but is a strongly marked form of *napaea* Morr.

Ozarba fannia Dru.

Eustrotia fannia Druce, Biol. Cent. Am. Het. I., 313, Pl. 29, fig. 12 (1889).

Ozarba fannia Hampson, Cat. Lep. Phal. X., 451 (1910).

Numerous specimens before us from San Antonio, Texas, Black Jack Spgs., Texas, and Kerrville, Texas, agree with Hampson's generic definition and correspond fairly with Druce's figure. The species had been misidentified for us by J. B. Smith as *Thalpochara ætheria* Grt., which, according to Hampson, who has the type before him, is generically distinct.

Eustrotia catilina Dru.

Eustrotia catilina Druce, Biol. Cent. Am. Het. I., 312, Pl. 29, fig. 5 (1889); Hampson, Cat. Lep. Phal. X., p. 598 (1910).

One ♂ and two ♀s from Shovel Mt., Texas; San Benito, Texas; Texas (Rauterberg).

Palindia micca Dru.

Palindia micca Druce, Biol. Cent. Am. Het. I., 319, Pl. 29, fig. 5 (1889).

A single ♂ in very fresh condition from San Benito, Texas, corresponds well with Druce's figure; shows, however, only traces of the terminal dark shading.

*Megalopygidae.**Megalopyge lapena* Schaus.

Megalopyge lapena Schaus, Jour. N.Y. Ent. Soc., IV., 58 (1896).

Gasina lapena Druce, Biol. Cent. Am. Het. II., p. 432, Pl. 86, fig. 13 (1897).

Three ♂s and one ♀ of this species, taken in Chiricahua Mts., Ariz., and Palmerlee, Ariz. (Aug.), are before us.

*Pyraustinae.**Edia semiluna* Sm.

Lythodes semiluna Smith, Can. Ent. 37, p. 67 (1905).

Cynaeda bidentalis Barnes & McDunnough, Cont. Nat. Hist. N. Am. Lep. I, (5) 33 (1912).

Edia microstigma Dyar, Proc. U.S. Nat. Mus. 44, p. 320 (1913).

A recent study of the unique type of *semiluna* Sm. proves conclusively that Smith's generic reference was faulty, as the species is a Pyraustid and identical with *bidentalis* B. & McD. There seems but little doubt that Dyar has redescribed the same species, creating the new genus *Edia* for its reception; as a new genus is probably necessary, the synonymy will be as stated above.

Noctuella castanealis Hlst.

Orobena castanealis Hulst, Tr. Am. Ent. Soc. XIII., 157 (1886).

Thalpochara jativa Barnes, Can. Ent., 37, p. 213 (1905).

An examination of the type specimen of *jativa* shows it to be a Pyraustid and, without much doubt, identical with *castanealis* Hlst., although we have not seen the type of this latter species.

MR. NORMAN CRIDDLE, of Treesbank, Manitoba, has been appointed a Field Officer of the Division of Entomology, Ottawa, to carry on investigations in Southern Manitoba.

MR. L. S. McLAINE, M. Sc., has been appointed a Field Officer of the Division and is now engaged, through the courtesy of Dr. Howard, in the rearing and collection of the parasites and predaceous enemies of the Brown-tail and Gipsy Moths in Massachusetts, in connection with the work of establishing the same in New Brunswick.

FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MIDNAPORE, ALTA.

(Continued from page 134.)

378. *Parastichtis discivaria* Walk.—This species is correctly named, and Sir George Hampson changed his opinion as to the distinctness of *gentilis* before publishing. Walker's type is from St. Martin's Falls, Hudson's Bay Territory, and is the strongly marked contrasting form, with pale luteous inner and postmedial areas. Type *perbellis*, from Evans Centre, N.Y., which Hampson makes "ab. 1." is similarly strongly marked, but more even in shade, and lacks the contrastingly pale areas. This is the form figured by Holland. *Gentilis*, from the same locality, is even red-brown, with indistinct maculation. All three forms occur here, and intergrade.

381. *Homoglaea hircina* Morr.—This has been rather common in recent years. I have never seen it in the fall, but it appeared in some numbers in the end of March, 1910, which I thought unusually early. This year however a few were seen at light during a mild spell on the 4th or 5th of March. A fortnight later the thermometer fell to about 15° below zero. It is a strikingly variable species, some of the forms being very pretty. The colour varies from a rather pale reddish luteous to dark chocolate brown. A handsome grey irroration is variably present or absent. Some are practically immaculate; others have the usual geminate cross lines of darker shades filled in with the ground colour, or with grey, the spots also sometimes outlined with grey. Sometimes most of the veins are grey lined. A rare form has black punctiform spots in the s.t., and still more rarely in the t.p. line also. A well defined median transverse shade sometimes exists, and generally runs through the middle of the reniform.

383. *Ipimorpha pleonectusa* Grt.—The type in the British Museum is a male from Evans Centre, N. Y. according to the Catalogue, and the eastern form seems to have reddish brown tints not possessed by specimens from Manitoba and Alberta, which Hampson makes "Ab. 1. Paler, and less red." Dr. Dyar, in the Kootenai List, says that both forms occur at Kaslo, and calls the light clay-coloured one "var. *æquilinea* Smith." Smith refers to

June, 1913

this as a mere synonym in his Catalogue, but I have seen neither type nor description.

384. *Dasypoudæa meadii* Grt.—High River (Baird).

385. *Copablepharon* sp.—This is not *absidum*, nor apparently any described species. I have seen a few other specimens besides the two previously referred to, but have only a single female in my collection, and do not care to describe from it. Mr. Baird has taken it at High River, and I have also seen a female taken by Mr. C. Garrett in Calgary on Aug. 1st, 1907. The primaries are very pale green, with slight fuscous irroration, and secondaries white, fuscous clouded centrally.

388. *Melaphorphyria oregonica* Hy. Edw.—*Oregona* of our lists is apparently a mis-spelling, as was also my previous rendering (Dr. Dyar's) of the generic name.

389. *Melicleptria septentrionalis* Hy. Edw.—Hampson makes this synonymous with European *ononis* Schiff. The type of *septentrionalis* is a male in the Neumœgen collection at Brooklyn, and is labelled "N.W.B.C."

390. *Heliaca nexilis* Morr.—Rather common at timber line in the mountains. My records are: Brobokton Creek, Wilcox Pass, and Sheep Mountain, July 10th to 22nd (Mrs. Nicholl); Mt. St. Piran, near Agnes Lake, Laggan, 72-75,000 feet, July 17th and 18th. This is the *nexilis* of the British Museum, Rutgers College, and Washington collections.

Var. *elaborata* Hy. Edw.—One male, Head of Pine Creek, June 9th, 1897. High River, June 10th, 1909, two ♀s (Baird). I have seen other specimens taken by Mr. Baird. This form is the *diminutiva* of my former notes on Smith's authority. The error was excusable, as the two are not unlike. But *diminutiva* has truncate frontal prominence, which this has not, and differs in colour and maculation as well. Holland's figure under *diminutiva* appears to be *Melicleptria persimilis* Grote, a species with rounded frontal prominence and spined tibiae. Superficially *persimilis* happens to bear a much closer resemblance to *elaborata* than to *diminutiva*, but has an additional white spot near base of secondaries.

One of my *elaborata* I have compared with the type, a Colorado female in the Henry Edwards collection. The main features in which it differs from what I take to be the true *nexilis* is that the head, thorax and primaries are strongly overlaid with yellowish, giving the impression, against the black ground, almost of bronzy green. In my three specimens, in addition to the yellowish or whitish band on primaries, there is a small yellowish mark in the cell before the orbicular. There is a trace of this in one only out of my ten mountain *nexilis*, and I notice it exists in Hampson's wood-cut of *nexilis*. After describing *nexilis*, Sir George Hampson gives "Ab. 1. *elaborata*, fore wing without the white spot in cell before the reniform." This is not in accordance with my notes on the type in the New York Museum, but I may possibly have overlooked this difference, which my specimens do not have. Several of my mountain *nexilis* lack this spot. In the British Museum collection an *elaborata* label is placed beside a Washington Forest Reserve specimen, which I should have called typical *nexilis*.

For a long time I was inclined to consider *elaborata* distinct, as I found it hard to believe that a species should occur here on the plains, and in the mountains, in so far as I had observed, at the timber line only. All the B.C. records I can find appear to be from mountains, elevation not given. So closely does *elaborata* resemble *persimilis* that I suspected the existence of tibial spines in the former. But I recently removed, bleached and mounted all the legs of my whole series of *nexilis* and *elaborata* without succeeding in finding a single spine on any tibia. I must admit that the differences between these two latter, such as they are, are very slight, and the observed variation suggests that with more material the forms may be found to overlap. What has made the matter still more interesting is that Mr. A. F. Winn and others have recently discovered *nexilis* at St. Hilaire, which is close to sea level in Quebec. I am indebted to Mr. Winn for a specimen, and except that it has rather less pink on secondaries beneath, it is practically a dead mate for one of my Mt. St. Piran timber line specimens. In Quebec, Mr. Winn says that the species flies in the middle of May. That is two months earlier than the mountain dates, but is probably easily explained by the altitude.

391. *Polychrisia trabea* Smith.—During 1910 I took this species in some numbers at flowers of wild larkspur, on which the larva in all probability feeds.

392. *P. purpurigera* Walk.—Edmonton, July 14th, 1910 (F. G. Carr.)

395. *Euchalcia putnami* Grote.—The type is a female in the British Museum. There I found North American and European specimens associated as one species under the name *festucae* Linn, and my notes say that the reference is apparently justified, as the European species varies to *putnami*. As a rule, the European form is darker and richer in colour and has a golden metallic spot at the base of the costa which *putnami* generally lacks. Another character not usually found in *putnami* is a metallic outer edging to the t.a. line below the median vein. In *putnami* the two central metallic spots are sometimes joined. I am not sure whether this is ever the case with *festucae*. At any rate, such variation is rare in Europe. Vancouver Island specimens vary very much nearer to typical *festucae* than do my local series. Some have the rich dark coloration, the metallic marks at base, and on the t.a. line; but the inner one of the two central spots less frequently extends a little above the median vein than it does in Alberta specimens, or than appears to be the case in *festucae*.

398. *Autographa californica* Speyer.—The most important distinctive mark between this species and *pseudogamma* I had overlooked in my previous paper. *Californica* has a fine black longitudinal streak anterior to the subterminal line near the apex, which usually reaches, or very nearly reaches, the t.p. line. In *pseudogamma* this streak is non-existent. It exists in *ou*, which resembles *californica* rather closely in pattern, though unquestionably distinct. As *ou* has quite recently been added to the Canadian list, on the strength of a specimen taken at Aweme by Mr. Criddle, a comparison with *californica* may be of special interest. In *californica* the t.p. line is somewhat deeply sinuate near the inner margin. If viewed with the outer margin of the wing upwards, that portion of the line below vein 2 has the shape of a written "n" with the top of the first stroke rather pointed. In *ou* this portion of the line is very slightly waved only. In *californica* the sign is usually

of the well-known Greek "gamma" form, but is sometimes formed of two separate marks. The inner one is roughly V-shaped, with the strokes out-curved. The outer mark is a lobe-shaped dot, which joins or tends to join the V at its apex—that is, at the point nearest the inner margin of the wing. In *ou* the inner mark is more U-shaped, and the outer spot is approximate to, and sometimes joins, it at a point nearest the outer margin. There are other differences in colour and maculation, but these are the most obvious. The difference in the sign is well shown in Ottolengui's figures. As a matter of fact, I find the signs in many *Autographas* much more variable than I had been led to suppose from first perusals of Ottolengui's paper. The most obvious structural differences between these two species is that *ou* has hind tibiae strongly spined, whilst *californica* has not.

Holland has his figures of the above three species badly mixed. On plate XXVIII., fig. 25, as *rogationis*, represents *ou*, whilst fig. 33, called *ou*, is of *pseudogamma*, and fig. 35, called *pseudogamma* is obviously *californica*.

The question as to the true status of closely allied forms separated by wide stretches of ocean will probably always give rise to controversy. The best way of dealing with the matter is probably to treat such forms as distinct, unless exactly similar specimens can be found on both continents. I am not aware that similar specimens have been found of our *californica* and European *gamma*, and therefore prefer to treat them as distinct. One difference in pattern appears to be that the upper portion of the t.p. line is more crenate in *californica*. All the maculation in our species is more clearly written, and shows greater contrasts. *Gamma* has the black streaks near the apex, but it is less developed than in *californica*. The sign is about similar in the two, and both have unarmed tibiae. But in general color of primaries *gamma* is darker and more even, and much more like normally coloured *ou*.

Grote in CAN. ENT. XXXV., p. 238, Aug. 1903, states that *ou* and *fratella* are distinct species, and that any confusion between them arose from misidentification of *ou*. In his 1905 list he places *californica* and *russea* as varieties of *ou*. The type of *russea* from

Colorado is in the Henry Edwards collection, and is a reddish *californica*. That of *fratella*, as well as *ou*, is in the British Museum, and I was satisfied that they were one species. *Fratella* is undersized. The type of *ou* had either no hind legs or they were so tucked up in the vestiture that I had no chance of finding spines.

401. *A. rubidus* Ottol.—I have six more local captures of this species in my collection, dated June 1st to July 5th, 1909 and 1910. It comes to light and treacle, and I have taken it on the wing after dark flying over vetches. I took six specimens during 1909 alone, five of them at treacle. The tail of the sign is not always produced to a point as in Ottolengui's figure of the type. It sometimes widens out into a slight lobe, rather like that of *californica*. On the other hand, I have *californica* in which the tail is much like that of the type of *rubidus*. The nearest well-known relation to *rubidus* is *precatiosis*.

402. *A. alias* Ottol.—I have only four Alberta specimens in my collection which I feel quite certain are this species. The Waghorn (Blackfalds) specimen previously referred to, a ♀ with ♂ abdomen attached; July 25th, 1902. A ♂ and two ♀s, Head of Pine Creek, Aug. 7th, 9th and 16th, 1897 and 1903. They agree with Ottolengui's figures, and have the sign nearer to that of *rectangula* than any other species, but not as heavy. In fact, *alias* is the nearest ally that *rectangula* has. Also taken at Banff, Aug. 4th, 1908 (Sanson).

I long hesitated in separating from this a form which I have been calling *octoscripta*. I have a local female, dated Aug. 21st, 1903, and another from Mr. Wallis, Winnipeg Beach, Man., Aug. 23rd, 1910. The latter specimen is almost the exact counterpart of Ottolengui's figures. Mr. Wallis showed me another female taken at the same place, Aug. 22nd. I have also given this name to a Banff male, one of Mr. Sanson's captures, August 1910. This has a more spider-like sign than any of the others. I have a male from Cowichan Bay, near Duncans, Vancouver Island, which is brighter coloured and has heavier sign, but which I think is the same. It resembles *alias* very closely in colour and general pattern, but is

rather darker. It has the irregular dentate terminal line of that species and *rectangula*, and the short blackish streak between that and the s.t. line opposite the reniform, of which there sometimes seems to be a trace in the other two species. The sign seems to be a modification of that in *alias*, which fact for long caused me to associate the two. As Grote describes it, it is "incompletely S-shaped, open superiorly." The outer portion of the S, however, seems sometimes to be a solid dot. The inner portion opens wide like that in *alias*, but is more thread-like. Other differences perhaps distinctive, appear to be that the t.a. and t.p. lines are more direct and less distinct. The t.p. line is, as Grote puts it, "waved or trembled, and appearing thus a distinguishing feature from Guenée's species" (*mortuorum*, *rectangula*). In *rectangula* and *alias* this line is scarcely crenate, but rather obviously waved. In *octoscripta* it is minutely but distinctly crenate, and but very slightly waved. I have carefully studied Grote's description, and the series standing under the name in the British Museum, and must for the present consider this Western form as dark and heavily marked *octoscripta*.

The British Museum series consists of six specimens—all very much alike, and looking somewhat bleached. There are two poor males, Nova Scotia (Redman), one of them badly rubbed. A pair, Grote collection, the male "Can." (This specimen was still unset when I saw it.) Two males, Hudson's Bay. The Grote collection females have two blue-bordered labels in Grote's handwriting—both "*Plusia 8-scripta* Sanb.," the upper label with "M.S." after the name. Whether this is really the type or not I cannot say. They are smaller than mine, as well as paler, and have the sign very thread-like, and similar in the whole series.

The description was published only by Grote, and the name should therefore be credited to him, though he used Sanbourne's Mss. name. The type specimens, number not stated, came from "Anticosti Island (Couper); Racine (O. Meske); Mass. (Prof. Packard)."

(To be continued.)

APPERCEPTIONAL EXPECTANCY AS A FACTOR IN
PROTECTIVE COLORATION.

BY HARRY B. WEISS, NEW BRUNSWICK, N. J.

It is a matter of common knowledge that many insects escape detection by reason of their resemblance to certain surroundings. *Conotrachelus nenuphar* Hbst., which drops to the ground when disturbed, resembles bits of soil so closely that it often escapes observation. Certain moths resemble the bark upon which they rest; many caterpillars resemble the foliage upon which they feed; in fact, such resemblances are almost too numerous to mention.

This phenomenon is known as protective coloration, and is usually dismissed without further thought. Upon analyzing it further, however, it is evident that other factors contribute toward the result obtained by the perception of such an insect amid such surroundings, or, in fact, any surroundings. The perception of an insect is modified by associated perceptions from adjoining surroundings. A perception of a colour received, for instance, from a butterfly's wing will depend in part upon other perceptions received at the same time from adjoining surroundings or adjoining parts of the butterfly.

In addition to sensation, which is the result of stimulation upon the organ of sight by the object in question, perception is also determined by apperception, which is the contribution of the mind from previous experience. In other words, the mind also contributes something which helps to form the complete mental content. A red background, for instance, arouses an apperceptual expectancy for red, a green background an apperceptual expectancy for green, and so on. Many green insects are rendered less conspicuous and sometimes inconspicuous against a green background by reason of this expectancy on the part of the observer. Without this expectancy factor such insects would be more conspicuous than they are. When a protectively coloured insect is removed from its surroundings, and both surroundings and insect viewed separately, the sensations are quite distinct.

Many trained observers, and, in fact, numerous birds, are able to overcome this expectancy, and as a result discriminate

such insects from their surroundings, although such discrimination may be due in part to an ability to perceive form. By reason of this apperceptual expectancy many insects also appear more conspicuous amid certain surroundings than others.

TABLE SHOWING THE EFFECT OF COLOURED BACKGROUNDS UPON INSECTS, THE COLOUR NEAREST THE NAME BEING THAT AGAINST WHICH IT IS MOST CONSPICUOUS, THE FOLLOWING COLOURS BEING ARRANGED IN THE ORDER APPROACHING INCONSPICUOUSNESS :

<i>Colias philodice</i> Gdt.	blue	red	green	yellow
<i>Danaus plexippus</i> Linn.	yellow	green	blue	red
<i>Pyrameis atalanta</i> Linn.	yellow	green	blue	red
<i>Plathypena scabra</i> Fab.	yellow	green	red	blue
<i>Mamestra trifolli</i> Rott.	yellow	red	blue	green
<i>Anasa tristis</i> DeG.	yellow	green	red	blue
<i>Murgantia histrionica</i> Hahn.	yellow	green	red	blue
<i>Arilus cristatus</i> Linn.	yellow	green	red	blue
<i>Cyllene robinia</i> Forst.	yellow	green	red	blue
<i>Rhynchites bicolor</i> Fab.	yellow	green	red	blue
<i>Polistes variatus</i> Cress.	yellow	green	red	blue
<i>Eristalis tenax</i> Linn.	yellow	green	red	blue

With most of the above species, at least, it is noticed that yellow is more or less a fatal background, as far as inconspicuousness is concerned. Green is less fatal, but it is only in the red and blue that anything like protection is gained.

The more the coloration of an insect approaches that of its surroundings, the less conspicuous it becomes, but in all cases apperceptual expectancy tends to make this inconspicuousness more complete, and, as a result, more protective.

DR. C. GORDON HEWITT, Dominion Entomologist, was elected a Fellow of the Royal Society of Canada at the recent meeting. He was also chosen to represent the Royal Society at the forthcoming Jubilee of the Entomological Society of Ontario.

DURING the months of June, July and August the editor will be away from the city. Manuscripts for publication may be sent to Mr. A. F. Winn, 32 Springfield Ave., Westmount, Que.

BOOK NOTICE.

"THE IMPORTATION INTO THE UNITED STATES OF THE PARASITES OF THE GIPSY MOTH AND THE BROWN-TAIL MOTH: A Report of Progress, with some consideration of previous and concurrent efforts of this kind." By L. O. Howard and W. F. Fiske. Bull. 91, Bureau of Entomology, U.S. Dept. of Agriculture, 344 pp., 27 plates, 74 text figs., 3 maps. July, 1911.

Perhaps no recent entomological undertaking has been watched with greater interest by American and Canadian entomologists than the attempt to establish on the American Continent the natural enemies of the Gipsy and Brown Tail Moths. This interest is due to two things: the immense destruction caused by the two insects in Massachusetts and the southern portion of New Hampshire and Maine, and to the fact that it is the first serious attempt to introduce all the effective insect enemies of a Lepidopterous host from one country, or series of countries, into another that has been made in the history of entomology.

The story of the work of introducing these insect enemies, together with that of previous and concurrent efforts of the same nature, is, as the title indicates, told in the Bulletin under consideration.

The first part consists of a discussion of previous work in the practical handling of natural enemies of injurious insects. It is an able discussion including many original and valuable observations. It presents, for the first time, a comprehensive view of the results that have attended the artificial transportation of insect parasites of various hosts in different quarters of the globe.

The second part tells the story of the introduction into the United States of the natural insect enemies of the Gipsy and Brown Tail Moths. The reasons for attempting the work are given at length, and the main issues of the experiment are fully discussed. Biological and other notes on a small army of parasites are recorded. Although the discussion is primarily that of the parasites of two Lepidopterous hosts, yet, on account of the fact that the author brings to bear upon the subject a splendid grasp of the broad subject of insect parasitism, it has a wide biological significance.

The sections on "Studies in the Parasitism of Native Insects" and "Parasitism as a Factor in Insect Control" are particularly interesting. To attempt, however, to pick out the most interesting and valuable portions of the work would be fruitless, as there is scarcely a paragraph that is not well worth reading.

A limited supply of the Bulletin was distributed in July, 1911. A general distribution has, however, only recently been made.

Since its publication a short article on "The Gipsy Moth as a Forest Insect," by the junior author, has appeared as Circular No. 164, U.S. Bureau of Ent. Speaking of the results of parasite importation, Mr. Fiske says: "On the whole, the results are decidedly satisfying, and the State of Massachusetts and the United States Department of Agriculture have no cause to regret having undertaken the unexpectedly formidable task of parasite importation. Within a territory entering a little to the northward of Boston, it may be conservatively stated that fully 50 per cent. of the eggs, caterpillars, or pupæ of the Gipsy Moth, in the aggregate, were destroyed by imported parasites in 1912." It is Mr. Fiske's opinion that this present rate of mortality in the central portion of the infested territory will eventually be considerably increased and will extend itself over the entire area of infestation.

In speaking of the amount of additional control necessary to check the increase of the Gipsy Moth in America, it is stated in Bull 91, p. 117, l. 11, that "An aggregate parasitism of 85% will almost certainly be sufficient, and it may well be that 80%, or even 75%, will answer equally well. Much less than 75% will probably not be effective."

In conclusion, it may be said that the Bulletin contains a wealth of information on a subject that has hitherto been little understood. It treats of a strictly scientific subject in a scientific way, and has the merit of being written in a particularly attractive style. It will be indispensable to any entomologist interested in natural control of insects. The excellent illustrations, of which the majority are original, materially enhance the permanent value of the work.

J. D. TOTHILL.

Mailed June 7th, 1913.

